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ABSTRACT

This report, the first of three on the effects of teaching kindergarten children the overhand throw, compares the children's final ball velocities to those of two control groups. Later reports will discuss the effect of instruction on the children's movement processes and the relationship between velocity and movement process. Forty-five children from two intact kindergartens in a Madison, Wisconsin public school were randomly assigned by sex to one of two groups: an experimental group that received a movement program including 120 minutes of guided practice in the overhand throw or a control group that received no exposure to the throw. A third group, randomly selected by sex from a comparable school, received no movement experience. Ten side-view, filmed trials of each subject's throw for force were taken before and after the 6-week period. Ball velocities for each trial were recorded simultaneously with the Roberts' velocimeter. No significant velocity differences between groups were reported, though boys throwing had significantly greater velocity than girls at both pre- and post-practice testing. One hundred twenty minutes of guided practice in the overarm throw did not significantly change the ball velocities of kindergarten children compared to two groups with no formal throwing experience. (Author/JA)

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THE EFFECT OF GUIDED PRACTICE ON OVERHAND-THROW BALL VELOCITIES OF KINDERGARTEN CHILDREN*

A report to the Research Section at the National Convention of the American Association for Health, Physical Education and Recreation, Minneapolis, April, 1973

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INTRODUCTION

Halverson (1966) has long asserted that the setting of force goals helps young children progress toward more advanced developmental stages of movement. Her assumption seems especially sound for the throw since the developmental stages of that skill were originally defined using a situation demanding force production (Wild, 1938). Many people, however, would extend Halverson's assumption by adding that the advanced stages elicited by the force goals should, in turn, immediately produce more force. Thus, they would predict that progression to new stages of throwing would be reflected by concomitant increases in ball velocity.

In the only study of young children pertinent to these two views, Hanson (1961) investigated differences in ball velocity between a group instructed in throwing for approximately 150 minutes and a non-instructed, control group. She found that although distance differentiated the children, velocity did not. Apparently, instruction stressing both force and angle of release had affected only the angle of release.

In interpreting Hanson's results, those who believe that ball velocity accurately indicates children's progress through throwing stages would have to conclude that Hanson's children remained at the same stage in their throwing despite instruction. Hanson, however, did suggest that her instructed children had exhibited "more mature executions of the overhand throw" (1961, p.79). If she was correct, her findings would imply that ball velocity was not an accurate indicator of young children's progress through throwing stages. This conclusion would fit somewhat with the view expressed by Halverson (1972) and her students (Roberton, 1972; Halverson, Roberton, & Harper, 1973) that traditional, so-called "product scores" may mask development at certain times in the life-span. Essentially, they feel that traditional scores -- distance or time, for example -- do not always indicate the movement process used to achieve those scores. Since development is defined in terms of movement process, a score cannot always be used to detect development at all points in the life-span.

Because Hanson's study seems to suggest that velocity may be one of these masking scores during early childhood, the following project was designed to study this question. The purpose of this investigation was to study the effects of instruction on 1) overhand throw ball velocities, 2) processes of movement, and 3) relationships between ball velocity and movement process in

kindergarten children. This report, the first of three on the results of this project, compares the instructed children's final ball velocities with those of two control groups.

DESIGN OF THE STUDY

Forty-five children from two intact kindergartens in a Madison, Wisconsin public school were randomly assigned by sex 1) to an experimental group which received a movement program that included 120 minutes of guided practice in the overhand throw over 8 weeks, or 2) to a control group (C_1) which received the same movement program with no exposure to the throw. Twenty-four additional kindergarten children from a comparable Madison school were randomly selected by sex for a second control group (C_2). They received no movement program and no exposure to the throw.

Two of the investigators, specialists in elementary school physical education, team-taught the experimental and C_1 kindergarten groups for two 30-minute periods per week from October 1971 to mid-May, 1972. For 8 weeks of that time children assigned to the experimental group received guided practice in the overhand throw. The other investigator continued to teach Group C_1 but gave them no throwing experience. In all other respects, the movement curriculum for both groups was the same. No control could be exercised over out-of-school activities.

GUIDED PRACTICE SITUATION

To preserve a balanced movement program during the eight weeks of the study, guided practice in forceful overhand throwing was included in only twelve of the sixteen available periods. Actually 5-15 minutes was probably the most any child received in one period, thus it was estimated that each child received only 120 minutes of guided practice in the throw. During these 12 periods, organizational plans varied from the total group practicing to individuals working with the teacher while other children pursued self-directed practice on different motor tasks.

The primary purpose of the guided practice was to effect maximum progress toward more advanced developmental levels in throwing. The teacher

used all methods which might provide assistance to individual children. The main emphasis, however, was on the setting of force goals. The children were often asked to throw as hard as they could in order to "crash" their balls* against the wall. Wide strips of colored paper, stretched the width of the gymnasium, yielded a distinctly different sound, depending on the velocity of the hit. The distance the ball rebounded from the wall provided direct visual feedback concerning the force of the throw. Emphasis was also placed on changes in the movement itself.

During all practices the teacher was constantly sensitive to the interest level of the children and changed the pace or situation as needed to keep the experience "fun" for them.

MEASUREMENT PROCEDURES

A. Records Obtained

Overhand throw records for all children in the study were obtained before and after the eight-week throwing experience. These records consisted of bi-plane 16mm. motion pictures taken simultaneously with direct, horizontal ball velocity recordings. Data on ten pre-test and ten post-test trials were collected for each child.

The ball velocities were measured by a Velocimeter modified for this study by Thomas Roberts (1972) from his original design. The Velocimeter records the time required for the ball to travel forward one meter. The elasped time for this meter of travel is read directly from a Simpson 2725 Electronic Counter and subsequently converted to velocity in feet-per-second.

The Velocimeter in this study was modified for use with children by reducing the collimators from 26 1/2 to 8 inches in height. It can be used under flourescent light up to 40 foot candles incident illumination, is easily portable, and has a set up time of four to six minutes.

B. Orientation of the Children

Since children in C_2 were not familiar with the investigators, one

*The equipment used in the guided practice included 3" diameter covered Oregon Worsted Fleece Balls, tennis balls and 3"x3" bean bags.

investigator participated with them in their classroom until she was accepted as a "helper" teacher. She then worked directly with the C_2 children in all measurement sessions.

One week before data collection, each child in the study participated in a 15-minute orientation session to help him become accustomed to the cameras. A place kick was used as the motor task in these sessions.

C. Data Collection

In the data collection periods, each child was given additonal time to become familiar with the equipment. When the child was ready, he was asked to throw hard through the Velocimeter toward the wall. Tennis balls were used for all data records. After three throws, trials were recorded until simultaneous velocity and film records were secured for ten trials. If a child substituted another type of throw, reminders were given concerning the overhand task. From time to time, the subject was asked to walk from the throwing area to pick out his next ball. This was done in case the child had accidentally placed his feet in a particular relationship within the throwing area, resulting in an atypical stance that continued for subsequent trials. For all other trials, the investigator handed the ball to the child. No additional clues were given other than random praise.

RESULTS

A. Pre-test velocity records were treated in two ways:

1) Subject by trials ANOVA'S for each sex within each treatment group indicated no significant differences across the ten trials ($\alpha<.05$). Therefore, the trial means were used to represent each child's score.

2) The data were then analyzed using a treatment by sex ANOVA to determine whether the three treatment groups were alike before throwing practice began. No significant difference was found between groups ($\alpha<.05$; $1 - \beta \tilde{=} .87$ for an effect of interest = 1σ (7 ft/sec). The blocking variable sex was significant, as would be expected ($\alpha<.05$).

B. Post-test ball velocity data were also treated in two ways:

1) A treatment by sex ANOVA indicated that, after guided practice, the three groups were still not significantly different from each other ($\alpha<.05$; $1-\beta \cong .87$ for an effect of interest = 1σ (7 ft/sec)). Table I, page 6, indicates the post-test means, Table II, page 6, the post-test ANOVA Summary. Again, the blocking variable sex was significant as expected.

2) ANOVA'S testing linear regression between pre-test scores and post-test scores for each sex within each treatment also indicated no significant linear relationships ($\alpha<.05$). No group showed linear change in their ball velocities from pre to post-test periods.

DISCUSSION

At first glance, it seems logical that 120 minutes would not make a significant difference in a child's ability to change his production of velocity in a complex skill, such as the over hand throw. Yet, it is of interest to note that few programs of physical education for young children provide more than two 30-minute movement periods a week or approximately 72 periods a year. Even if one movement task, such as the overhand throw for force, were to be emphasized as much as 10 minutes per period during 1/4 of all the periods available, the time allotted to the throw would not be more than 180 minutes a year. If both Hanson's and this study have not effected significant change in ball velocities because of their short duration, it is obvious that schools will have to allot considerably more time to physical education if they hope to effect greater change than these research studies have been able to produce. It seems also clear that in the future researchers must extend their studies well beyond the 120 minutes used in this investigation.

On the other hand, if further research of longer duration also fails to yield significant differences between instructed and non-instructed groups, it may well be that velocity measures alone are not the proper indices of throwing development in the young child. Since velocity is the product of a complex interaction of movements, development within any part of this complex might not be immediately reflected by the velocity score. Yet, developmental

TABLE I: Post-test Ball Velocity Means and Cell n's

SEX	Experimental	C_1	C_2	Across Treatments
Boys	39.29 (12)	36.98 (12)	35.30 (12)	37.19 (36)
Girls	24.25 (12)	31.82 (9)	26.16 (12)	27.01 (33)
Across Sex	31.77 (24)	34.77 (21)	30.73 (24)	32.32 (69)

TABLE II: Analysis of Variance Summary Table (All sums of squares, mean squares, and F-ratios are Scheffe´ approximations for unequal n's)

SOURCE	SUMS OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO
Treatment	162.621	2	81.310	1.70
Sex	1630.779	1	1630.779	34.01*
Treatment X Sex	281.225	2	140.612	2.93
Within cells	3020.856	63	47.950	

*Significant at $\alpha < .05$; $1 - \beta = .87$ for an effect of interest = 1σ(≈7 ft/sec.)

changes in movement could be occurring which would ultimately be important to the final organization of the throw. Films taken concurrently with the above velocity records are now being studied to see if the instructed children's movement did, in fact, show signs of such development.

CONCLUSION

One hundred twenty minutes of guided practice in the overhand throw did not significantly change the ball velocities of kindergarten children compared to two groups with no formal throwing experience.

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